BULLETIN OF THE

PENNSYLVANIA

Department of Agriculture

HARRISBURG, PA.

Vol. 4 FEBRUARY, 1921 No. 2

GENERAL BULLETIN NO. 353

LIME REPORT

1920

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BUREAU OF CHEMISTRY

Published Monthly by Direction of

FRED RASMUSSEN, *Secretary of Agriculture*, Harrisburg, Pa.

Entered as Second Class Matter, March 22, 1918, at the Post Office at Harrisburg, Pa. under the Act of June 6, 1900. Acceptance for mailing at special rate of Postage provided for in Section 1103, Act of October 3, 1917, authorized on June 29, 1918.

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LETTER OF TRANSMITTAL

DEPARMENT OF AGRICULTURE
BUREAU OF CHEMISTRY

Harrisburg, Pa., January 25, 1921.

Hon. Fred Rasmussen,
Secretary of Agriculture,
Harrisburg, Pa.

Dear Sir:—I have the honor to transmit herewith for your approval a report of the results of the inspection of Agricultural Lime products showing the analyses of samples obtained by the special Agents during the Spring and Fall season of 1920 representing the registered brands sold in the State.

It is recommended that this report be published in bulletin form for distribution.

Very respectfully,

JAMES W. KELLOGG,
Chief Chemist.

LIME REPORT
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INTRODUCTION

In the enforcement of the law regulating the sale of Agricultural Lime Products during the Spring and Fall inspection seasons of 1920 the special agents of the Bureau of Chemistry secured 108 official samples of brands being offered for sale throughout the State, which together with reports covering each sample, were submitted for examination. Of this number 84, representing 40 different brands registered by 35 manufacturing companies, were analyzed for calcium oxide and magnesium oxide for the purpose of determining whether or not the guarantees shown upon sacks or attached cards, as required were correct. Determinations were also made for acid insoluble matter and in the case of lime for carbon dioxide, which shows the amount of "core" or unburned limestone remaining in the product and in the case of gypsum or land plaster for sulphur trioxide which is in combination with calcium oxide to form calcium sulphate. Determinations were also made in the samples of Pulverized Limestone and Artificial Carbonate of Lime for the degrees of fineness or the size of sieve mesh through which the coarsest particles would pass upon sieving. The official samples represented 7 kinds or classes of Lime Products and the results of analyses of each were classified according to these types and tabulated for comparison. These tables, together with the classes of lime products and number of samples in each were as follows: Table I, Pulverized Limestone, 24; Pulverized Oyster Shell, 4; Artificial Carbonate of Lime, 4; Marl, 4; Table II, Lime 4; Hydrated Lime, 42; Table III, Gypsum, 2. Compared with the results obtained for the samples examined during 1920 a slight improvement in labelling and guaranteeing was noted, although there were 28 samples or 33.3 per cent. which were found to contain 1.00 per cent. or more less calcium oxide and 3 samples of lime and hydrated lime were found to contain less magnesium oxide than guaranteed. The largest proportion of deficiencies occurred in

the case of Hydrated Lime (Low Magnesia) where one-half of the samples were deficient to the extent of 1.00 per cent. or more in calcium oxide, although in a number of these cases, as will be noted, the magnesium oxide exceeded the guarantees, thus in a measure balancing up the total amount of oxides necessary for neutralizing soil acidity. There were a number of cases where the full information was not given upon sacks or attached cards as required, however, as the producers become more familiar with the requirements of the law it is anticipated that these discrepancies will be overcome.

In addition to the official samples 56 Special Samples were submitted by residents of the State which were analyzed for a fee of $1.00 each as provided for by the law. As soon as the analyses were completed reports were issued to the senders, including receipt for the fees, as well as replies to inquiries relative to registration, guaranteeing and labeling.

The following pages include, Acknowledgments, Copy of the Law, instructions relative to Registration, Analyses of Special Samples and Required Labeling, Average Analyses and Retail Prices, a Discussion of the Results of Inspection and tables showing the analysis of each sample in detail tabulated according to the foregoing classification.

ACKNOWLEDGMENTS.

Mr. V. B. Hausknecht, First Assistant Chemist, had charge of the reception and preparation of samples, immediate supervision of the analytical work and made duplicate analyses where required. The samples were analyzed by Messrs. Frank B. Williams and Claude R. Engle, Assistant Chemists; Mr. W. E. Huber, Clerk, assembled the data and arranged the tabulations for this report and the samples were prepared for analysis by Mr. W. W. Cassel, Laboratory Assistant.

LIME LAW.

No. 306.

AN ACT

To regulate the sale for agricultural purposes of crushed limestone, lime, gyppsum, and related products; defining said products; and prescribing penalties for the violation of this act.

Section 1. Be it enacted, &c., That every bag, barrel, or other package or quantity, of any pulverized limestone, ground oyster shells, artificial carbonate of lime, ground lime, spraying lime, slaked-lime, hydrated lime, hydrated spraying lime, marl, gypsum, or land-plaster, sold, offered, or exposed for sale, within this Commonwealth for use as a soil amendment or as an ingredient or reagent in the preparation of any fungicide or insecticide, shall have attached to it or be accompanied, in a manner provided in section three hereof, by a plainly printed statement giving the name and address of the manufacturer or importer and his place of business, the brand or trade-name of said material, the net weight of the contents of the package, when sold in package, and a statement declaring, with respect to pulverized limestone, ground oyster shells, and artificial carbonate of lime: (a) The degree of fineness of the material, in terms of the minimum sieve-mesh, expressed in fractions of an inch, through which the coarsest particles of said material can pass; and (b) the minimum percentages contained of available oxides of calcium and magnesium, respectively, combined as carbonates; with respect to lime, ground lime, spraying lime, slaked-lime, hydrated lime, hydrated spraying lime, and marl, the minimum percentages contained of the available oxides of calcium and magnesium, respectfully; and with respect to gypsum, or land-plaster, the minimum percentages contained of available calcium oxide and sulphur trioxide, or sulphuric acid (SO^3) respectively; which statement shall be held to be the guaranty of the manufacturer or importer that the goods to which said statement refers are of the kind and quality; or composition and fineness, so set forth. The provisions of this act shall not, however, apply to air-slaked lime, kiln-slakes, gas-house lime, or tanners' lime, when sold as such.

Section 2. For the purpose of this act, the materials named in the foregoing section are defined as follows:—

(1) Limestone is the rock commonly known by that name, and consisting chiefly of calcium carbonate, or of said carbonate with a smaller molecular proportion of magnesium carbonate.

(2) Pulverized limestone is limestone reduced by mechanical means to a fine powder.

(3) Artificial carbonate of lime is carbonate of lime artificially produced by any method other than the exposure of lime, ground lime, slaked-lime, hydrated lime, or spraying lime to the action of the atmosphere.

(4) Lime is the product obtained by the complete burning of limestone in a kiln, and capable of being reduced by slaking to a fine powder.

(5) Ground lime is lime reduced to a fine powder by grinding.

(6) Spraying lime is lime of high purity, containing not less than ninety-three per centum of calcium oxide and not more than five per centum of magnesium oxide, not more than five per centum of carbon dioxide, nor more than five per centum of acid insoluble matters, iron or aluminum oxides, collectively.

(7) Slaked lime is the dry finely divided product obtained by the addition of water to lime.

(8) Hydrated lime is slaked-lime prepared by the aid of stirring, or of stirring, grinding, and screening machinery, and is free from hard lumps.

(9) Hydrated spraying lime is dry finely divided hydrated lime of purity not less, after taking the water of hydration into account, than that herein required in the case of spraying lime, and of such fineness that all shall pass a standard sieve of one hundred meshes to the inch.

(10) Air-slaked lime is the more or less finely divided product obtained when lime, slaked-lime, hydrated lime, or spraying lime is exposed for a considerable time to the action of the air.

(11) Marl is clay highly charged with carbonate of lime. Shell marl is marl in which the carbonate of lime is present chiefly in the form of molluscan shells.

(12) Gypsum, or land-plaster, is the finely divided mineral, commonly known by that name, and consisting chiefly of calcium sulphate.

(13) Kiln-slaks is refuse lime mixed with ashes and "core," or imperfectly burned limestone.

(14) Gas-house lime is spent lime that has been used as a purifier in the manufacture of illuminating gas.

(15) Tanner's lime is spent lime that has been used in the curing of hides.

Section 3. The statement required by section one of this act shall, in the case of goods sold in package, be plainly printed upon the package, or upon a tag or label fastened thereto, of such quality and in such manner that it shall not be detached in handling, and, in the case of goods sold in bulk, the said statement shall be delivered to the purchaser either with the invoice therefor or with the goods.

Section 4. Every manufacturers or importer of one or more of the materials named in section one of this act, for either or both of the purposes therein stated, shall, on or before the first day of January of each year, or before offering them for sale in this Commonwealth for either of said purposes, file annually with the Secretary of Agriculture a statement of the names and number of brands of such ma-

terials having distinct trade-names that he shall offer for sale, for either or both of said purposes, during the next ensuing calendar year or remainder thereof, together with a copy of the statement declaring the composition of these several brands of said materials, as required by section one of this act.

Section 5. In addition to the statement required by section four of this act, every manufacturer or importer of any of the materials named in section one of this act shall on or before the first day of January of each year, or before offering them for sale within this Commonwealth, file annually with the Secretary of Agriculture an affidavit showing, as nearly as practicable, the weight of each brand of said materials sold by him, or, if the producer or vendor be a firm or corporation, by its managers, officers, and agents, within this Commonwealth, for either or both of the purposes named in section one of this act, during the last preceding year; and for each brand so sold he shall pay to the Secretary of Agriculture a license fee, according to the weight sold, as follows: For an amount exceeding one hundred tons, but not exceeding one thousand tons, five dollars; for an amount exceeding one thousand tons, but not exceeding five thousand tons, ten dollars; and for an amount exceeding five thousand tons, twenty dollars; and when said fees shall have been paid, and the statements required by section four of this act have been filed with Secretary of Agriculture, the party or parties who have made such payment, and otherwise complied with the provisions of this act, shall be entitled to sell within the Commonwealth the goods specified in said statement and covered by said fees during the year, or fraction of a year, immediately following said statement. If the manufacturer or importer shall not have made during the preceding year any sales within the Commonwealth, for the aforesaid purposes, of any brand to be offered for sale during the year for which the fee is to be paid, he shall pay for each such brand a fee of five dollars. All moneys so received shall be immediately paid by the Secretary of Agriculture into the State Treasury, for the use of the Commonwealth.

Section 6. Any person or persons selling, offering, or exposing for sale, for either of the purposes stated in section one of this act, any of the materials named therein or brand of the same, unless accompanied by the statement required by section one of this act, or, when so accompanied, if the said statements shall be false in any particular, or without having complied with all the foregoing provisions of this act, shall be guilty of a misdemeanor; and on conviction shall be sentenced to pay a fine of not less than ten nor more than fifty dollars for the first offense, and not less than one hundred dollars for each subsequent offense. It shall be the duty of the Secretary of Agriculture to enforce the provisions of this act; and all penalties, costs, and

fines received shall be paid to him or his duly authorized agent, and by him shall be immediately paid into the State Treasury, for the use of the Commonwealth.

Section 7. The Secretary of Agriculture is hereby empowered to collect samples of the materials named in section one of this act, either in person or by his duly qualified agent or representative to have them analyzed, and to publish the results for the information of the public; and for this purpose the said Secretary of Agriculture, such assistants, agents, experts, chemists, detectives, and counsel as he shall duly authorize, shall have full access, ingress, and egress to and from all places of business, quarries, kilns, factories, barns, buildings, carriages, cars, and vessels used in the manufacture, storage, transportation, or sale of any of the said materials. They shall also have power to open any package or vessel containing or supposed to contain any of the said materials, and to take therefrom samples for analysis, upon tendering the value of said samples. Any manufacturer or producer of any of the materials named in section one of this act, located, in the Commonwealth, shall be entitled to have a single sample of any distinct brand, for the sale of which he has paid the fee required by section five of this act, analyzed by the Department of Agriculture, under such regulations as the Secretary of Agriculture may prescribe with respect to the points of composition specified in said section one, upon sending sample properly sealed and carriage prepaid, together with a fee of one dollar for each such analysis; but not more than two brands shall be analyzed, under the privilege conferred by this proviso, for one manufacturer or producer in a single year. None of the provisions of this act shall apply to sales of limestone, or limestone products or marl, when such sales are made at the quarry or pit in bulk, and delivered to the wagons of the users, who are presumed to be acquainted with the qualities of the local products.

Section 8. To carry out the provisions of this act for the period ending June first, one thousand nine hundred and seventeen, the sum of four thousand dollars ($4,000), or so much thereof as may be necessary, is hereby specifically appropriated to the Department of Agriculture.

Section 9. This act shall go into effect on the first day of January one thousand nine hundred and sixteen.

Approved—The 1st day of June, A. D., 1915.

MARTIN G. BRUMBAUGH.

REGISTRATIONS.

With the exception of air-slakes, kiln-slakes, gas-house lime and tanner's lime when sold as such, all Lime Products, before being sold or offered for sale for agricultural purposes, are required to be registered with the Department of Agriculture on or before January 1 of each year or before being placed on sale. Those desiring to sell agricultural lime in the State should request the Bureau of Chemistry, Pennsylvania Department of Agriculture, Harrisburg, to send them blank registration forms in which should be inserted the following information: A statement of the brand names of the Lime Products to be placed on sale, an affidavit of the number of tons sold, if any, during the preceding year, and a statement of the guarantees for each brand to be registered and sold. The guarantees required are as follows: For ground or pulverized limestone, ground oyster shells and artificial carbonate of lime; The minimum percentages contained of calcium oxide and its equivalent as calcium carbonate; for magnesium oxide, and its equivalent as magnesium carbonate and the degree of fineness or the number of sieve-mesh through which the coarsest particles or all of the material will pass upon sieving; for lime or burned lime, either in lump or ground form, hydrated lime, slaked lime, spraying lime and marls; the minimum percentages contained of calcium oxide and magnesium oxide; for gypsum or land plaster the minimum percentages contained of calcium oxide and sulphur trioxide. The registration fees required are five ($5.00) dollars for new brands, where no sales have been made during a previous year, and from $5.00 to $20.00 based upon the number of tons sold, namely; 100 to 1,000 tons, $5.00; 1,000 to 5,000 tons, $10.00; and for an amount exceeding 5,000 tons, $20.00. Upon receipt of forms for application for registrations properly made out, together with certified checks made payable to Fred Rasmussen, Secretary of Agriculture, for the amount of registration fees, the listed brands of lime products will be registered and a license issued permitting the sale of the brands so registered, for the calendar year. In cases where the composition of lime products is not known, and for the purpose of arriving at the proper guarantees to be given, as required for registrations and for labeling, special samples will be analyzed for residents of the State for a fee of one ($1.00) dollar for each sample. Those wishing such analyses made should follow the directions outlined in the following paragraph.

ANALYSES OF SPECIAL SAMPLES.

For the purpose of aiding those desiring to arrive at proper guarantees for the registration and sale of Lime Products as well as to furnish information with respect to the composition of such materials, special samples will be analyzed for a fee of one ($1.00) dollar as provided by the lime law, determinations being made for calcium and magnesium oxides, the equivalents calcium and magnesium carbonates estimated and for acid insoluble matter. Residents of Pennsylvania desiring to have such samples analyzed should proceed as follows:

Amount of Sample:—Where Lime Products are stored in bulk or bins portions should be carefully taken from as many different places as convenient and if in sacks portions should be drawn or selected from several different sacks, placed on a clean mixing cloth, table or floor, and carefully mixed to insure a uniform sample and as representative as possible of the entire lot or shipment. Approximately a 1 lb. sample should be selected by means of quartering and sub-dividing the mixture and placed in a suitable container, to be sent by express or parcel post.

Charge for Analysis:—A charge of one ($1.00) dollar is made for each sample analyzed and this fee may be submitted in the form of check, money order, or cash and should be inclosed in a letter requesting the analysis to be made, and both sample and letter addressed as follows:

Address:—The sample and letter inclosing fee should be addressed to the Bureau of Chemistry, Pennsylvania Department of Agriculture, Box 108, Harrisburg, Pa. The name of the sample or samples and the name of the sender should be plainly written on the package, or if more than one sample is submitted, a number, letter or name designating each should be included in order to avoid errors. As soon as possible after receipt of samples and fees, reports will be submitted to the sender showing the results secured, together with receipt for the amount of fees.

REQUIRED LABELING.

In addition to the information required to be shown in registration forms all sacks containing Lime Products, or attached cards, are required to be printed, or if sold in bulk a statement should be placed on the bins or delivered to the purchaser, showing the number of net pounds, the brand name, or name of product, name and address of Manufacturer, or Importer and the guaranteed analysis. The minimum guarantees are required for each class of lime products as follows:

Pulverized limestone, ground oyster shells and artificial carbonate of lime: The minimum percentages contained of calcium oxide and its equivalent as calcium carbonate, of magnesium oxide and its equivalent as magnesium carbonate and the degree of fineness or the number of sieve-mesh through which the coarsest particles or all of the material will pass.

Lime or burned lime, either in lump or ground form, hydrated lime, slaked lime, spraying lime and marl: The minimum percentages contained of calcium oxide and magnesium oxide.

Gypsum or land plaster: The minimum percentages contained of calcium oxide and sulphur trioxide.

In order to more clearly illustrate the method of labeling, required for sacks or attached cards, or for cards to be attached to bins when sold in bulk, facsimile tags are included as follows:

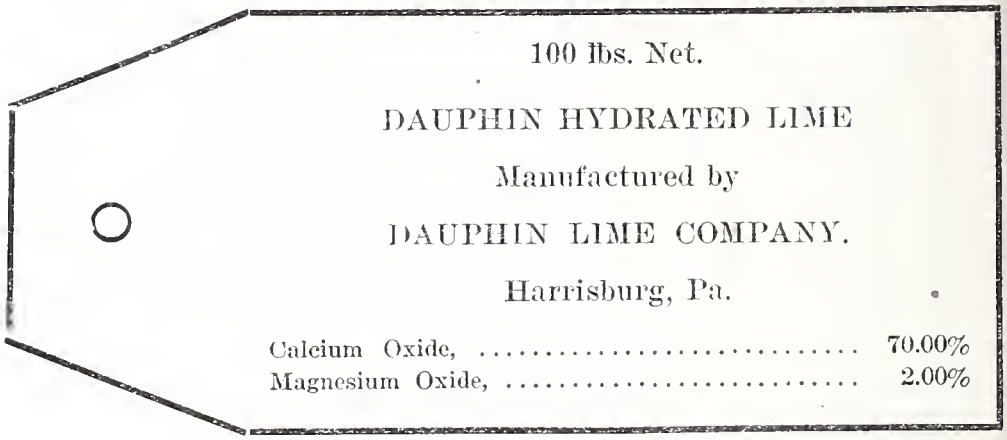
For Ground Limestone, Ground Oyster Shells, and Artificial Carbonate of Lime.

100 lbs. Net.
DAUPHIN PULVERIZED LIMESTONE
Manufactured by
DAUPHIN LIMESTONE CO.,
Harrisburg, Pa.

Calcium Oxide,	50.00%
Calcium Carbonate Equivalent,	90.00%
Magnesium Oxide,	1.50%
Magnesium Carbonate Equivalent,	3.93%

Fineness—Sieve Mesh=No. 20.

For Lime, Hydrated and Slaked Lime and Marl.



DISCUSSION OF THE RESULTS OF INSPECTION.

PULVERIZED LIMESTONE AND OYSTER SHELL, ARTIFICIAL CARBONATE OF LIME AND MARL.

Analyses in Table I.

Twenty-four samples of Pulverized Limestone, the natural Limestone Rock ground and pulverized, which were received and analyzed, represented 10 registered brands. They were found to contain from 39.09 per cent. calcium oxide and 69.73 per cent. calcium carbonate to 55.20 per cent. calcium oxide and 98.47 per cent. calcium carbonate, averaging 50.58 per cent. calcium oxide, equivalent to 90.27 per cent. calcium carbonate. They also contained from .64 per cent. magnesium oxide and 1.34 per cent. magnesium carbonate to 7.53 per cent. magnesium oxide and 15.75 per cent. magnesium carbonate, averaging 1.64 per cent. magnesium oxide, equivalent to 3.43 per cent. magnesium carbonate. The insoluble matter ranged from .45 per cent. to 15.35 per cent. and averaged 5.51 per cent. There was one sample of dolomite origin, containing less calcium oxide and more magnesium oxide than the usual grades of Pulverized Limestone, which was not included in estimating the averages. It analyzed 30.29 per cent. calcium oxide, equivalent to 54.03 per cent. calcium carbonate, and 20.26 per cent. magnesium oxide, equivalent to 42.37 per cent. magnesium carbonate. The determinations for the degrees of fineness, or the

size of sieve mesh through which all of the sample would pass upon sieving, showed that they varied in fineness from those passing a No. 10 to a No. 40 mesh sieve and averaged fine enough to pass a No. 15 mesh sieve. They were all of such a degree of pulverization that 100 per cent. of each sample was found to pass a No. 10 mesh sieve. The amounts passing a No. 50 mesh sieve varied from 44.8 per cent. to 99.4 per cent., averaging 78 per cent., and those portions which passed through a No. 100 mesh sieve varied from 34.6 per cent. to 88.4 per cent., (92.5 per cent. in sample excluded from average) and averaged 65.6 per cent. The retail selling prices were from $5.20 in a sample analyzing 49.94 per cent. calcium oxide and 2.48 per cent. magnesium oxide, to $12.50 in one containing 46.71 per cent. calcium oxide and .64 per cent. magnesium oxide and averaged $7.31 a ton. There were 7 samples of Pulverized Limestone, which contained 1 per cent. or more less calcium oxide than guaranteed and in some cases, as will be noted, deficiencies were considerably greater, however, in many of these cases of low calcium oxide the magnesium oxide exceeded their guarantees thus compensating for the deficiencies.

The 4 samples of Ground Oyster Shell, representing 1 brand, were found to contain from 45.20 per cent. to 49.36 per cent., averaging 47.60 per cent. calcium oxide, equivalent to 80.63 per cent., 88.05 per cent. and 84.91 per cent. calcium carbonate respectively. The magnesium oxide varied from .52 per cent. to 1.77 per cent., averaging .85 per cent., being equivalent to 1.09 per cent., 3.07 per cent., averaging 1.77 per cent. magnesium carbonate respectively. The insoluble matter varied from 5.95 per cent. to 12.83 per cent. and averaged 8.78 per cent. Determinations for the degree of fineness showed that all of each sample would pass a No. 20 mesh sieve and 100 per cent. in each case was found to pass a No. 10 mesh sieve. The proportions passing through a No. 50 mesh sieve showed results of from 61.5 per cent. to 66.6 per cent., averaging 64.4 per cent. and the proportions found to pass a No. 100 mesh sieve varied from 34.2 per cent. to 43.1 per cent. and averaged 39.3 per cent. All of these samples ran 1 per cent. under their guarantees in calcium oxide. The retail selling prices were from $11.25 to $14.00 and averaged $12.81 a ton.

The Artificial Carbonates of Lime, those materials which were obtained as by-products from some manufacturing process and listed as being Artificial because of their being different in character from the pulverized natural stone and other forms of carbonates, numbered 4 samples and included 2 different brands. They were found to contain upon analysis, from 47.95 per cent. to 53.94 per cent., averaging 51.41 per cent. calcium oxide, being equivalent to 85.53 per cent., 96.22 per cent., averaging 91.70 per cent., calcium carbonate respectively. They contained also from .75 per cent. to 7.37 per cent.,

averaging 3.36 per cent, magnesium oxide, being equivalent to 1.57 per cent., 15.41 per cent., averaging 7.02 per cent. magnesium carbonate respectively. The insoluble matter varied from .55 per cent. to .92 per cent. and averaged .68 per cent. The results of sieving tests showed that 1 sample was fine enough to pass a No. 10 and 3 a No. 20 mesh sieve. They all passed a No. 10 mesh sieve and the percentage proportions passing a No. 50 mesh sieve varied from 85.1 per cent. to 94.9 per cent., averaging 88.7 per cent. and the portions passing a No. 100 mesh sieve were from 75.8 per cent. to 90.6 per cent. and averaged 81.2 per cent. The selling prices were from $10.95 to $13.00 and averaged $11.99 a ton. No deficiencies in calcium oxide were noted in this class although one contained .50 per cent. less magnesium oxide than claimed, which was more than offset by the overage in the case of calcium oxide.

There were 4 samples of Marl, the natural deposit in which the calcium is largely present in the form of shells, which were found to contain from 42.64 per cent. to 52.30 per cent., averaging 46.92 per cent. calcium oxide, being equivalent to 76.07 per cent., 93.30 per cent., averaging 83.70 per cent. calcium oxide respectively and from .54 per cent. to 1.41 per cent., averaging .88 per cent. magnesium oxide, being equivalent to 1.13 per cent., 2.95 per cent., averaging 1.84 per cent. magnesium carbonate respectively. The insoluble matter was from 2.95 per cent. to 11.92 per cent. and averaged 6.16 per cent. One sample was found to contain 2.36 per cent. less calcium oxide than guaranteed. The selling prices were from $10.00 to $16.00 and averaged $12.25 a ton.

LIME AND HYDRATED LIME.

Analyses in Table II.

There were only 4 samples of Lime, the product resulting from the burning of Limestone Rock, representing as many registered brands received during the year. Two of these were classified as low magnesia grades which, upon analysis, were found to average 70.68 per cent. calcium oxide, 1.21 per cent. magnesium oxide, 9.49 per cent. carbon dioxide, 5.70 per cent. acid insoluble matter and the average retail selling price was $10.02 a ton. The 2 high magnesia samples were of dolomite origin and had an average composition of 51.88 per cent. calcium oxide, 35.40 per cent. magnesium oxide, 2.31 per cent. carbon dioxide, 2.43 per cent. acid insoluble matter and retailed at $14.50 a ton. One sample was deficient in calcium oxide and 2 in magnesium oxide. The acid insoluble matter in these samples varied from .16 per cent. to 7.20 per cent. and the variations in carbon dioxide were from 1.21 per cent. to 16.04 per cent. indicating that the "core" or limestone remaining unburned amounted to from 2.75 per cent. to 36.50 per cent.

The products offered for sale as Hydrated Lime represented 19 registered brands and numbered 42 samples. There were 26 samples and 13 brands classified as low magnesia types and 16 samples and 6 brands of dolomite origin or high magnesia Hydrated Limes. Those samples of the low magnesia type were found to contain from 49.53 per cent. to 70.36 per cent., averaging 63.16 per cent. calcium oxide and from .65 per cent. to 14.94 per cent., averaging 5.32 per cent. magnesium oxide. The acid insoluble matter varied from .25 per cent. to 13.05 per cent. and averaged 3.50 per cent. and the retail selling prices were reported as being from $10.75 to $19.00, averaging $14.72 a ton. Those samples of the high magnesia type were found to contain from 43.17 per cent. to 48.72 per cent. and averaged 46.30 per cent. calcium oxide. The determinations for magnesium oxide showed variations of from 29.16 per cent. to 33.50 per cent., averaging 30.92 per cent. The amounts of acid insoluble matter were from .95 per cent. to 3.80 per cent. and averaged 1.71 per cent. and the retail selling prices were from $13.50 to $20.00 and averaged $15.82 a ton. Of this class of Lime Products 14 of the low magnesia type analyzed 1 per cent. or more below the guarantees in calcium oxide and 1 in magnesium oxide. The remaining samples were found to be well above the guarantees, as will be noted.

GYPSUM OR LAND PLASTER.

Analyses in Table III.

Only 2 samples of Gypsum, representing a registered brand of Ground Land Plaster, were received. They had an average composition of 33.05 per cent. calcium oxide and 39.52 per cent. sulphur trioxide. From the average percentage of sulphur trioxide the calcium sulphate was estimated showing that 67.23 per cent. was in the form or combination in which the calcium and sulphur were present in the products. These 2 samples differed considerably in their composition, 1 being low in calcium oxide, containing 28.78 per cent., and high in acid insoluble matter, containing 13.15 per cent., while the other sample analyzed 37.31 per cent. calcium oxide and 1.07 per cent. acid insoluble matter. The retail selling price reported with one sample, representing the shipment involved, was $18.00 a ton.

AVERAGE ANALYSES AND RETAIL PRICES.

Average compositions or analysis of Lime Products are of interest in making a comparison of the analysis of any brand or grade of material with the average composition of several such products of like character and where these averages can be had for a large number of samples or of those analyzed for a number of years the results are greater in interest and value in proportion to the number of such samples included in estimating average compositions. The average analyses and retail selling prices of each of the six classes of Lime Products examined during 1920 have been estimated and together with the average results reported for the four preceding years, beginning with the first year's inspection work and making a record of five years' average results from 1916 to 1920 inclusive, were tabulated as follows:

Classes of Lime Products.	Number of samples.	Moisture.	Calcium oxide.	Magnesium oxide.	Insoluble matter.	Price per ton.
Pulverized limestone,	24	0.20	50.58	1.64	5.51	7.31
1919 samples,	56	0.14	49.94	1.89	6.34	7.29
1918 samples,	29	0.09	46.31	4.32	7.54	7.39
1917 samples,	21	0.12	44.35	4.58	9.54	4.61
1916 samples,	31	0.15	45.67	4.76	7.55	4.14
Total average,	161	0.13	47.83	3.19	6.82	6.36
Pulverized oyster shell,	4	1.02	47.60	0.85	8.78	12.81
Artificial carbonate of lime,	4	0.29	51.41	3.36	0.68	11.99
1919 samples,	18	0.56	51.32	2.43	0.87	10.64
1918 samples,	13	2.60	50.31	2.58	1.47	9.01
1917 samples,	16	0.56	50.45	2.13	1.53	7.56
1916 samples,	21	0.53	50.44	2.68	1.49	6.34
Total average,	72	0.99	50.70	2.52	1.29	8.48
Marl,	4	2.10	46.92	0.88	6.16	12.25
1919 samples,	3	3.23	47.28	0.72	5.09	8.92
1918 samples,	3	3.07	48.35	0.86	5.19	9.50
1917 samples,	6	1.97	46.29	0.93	6.36	6.89
1916 samples,	6	3.64	46.03	1.36	6.05	5.79
Total average,	22	2.77	46.75	1.00	5.90	8.20
Lime, low magnesia,	2	----------	70,68	1.21	5.70	10.02
1919 samples,	15	----------	69.42	2.44	9.05	9.60
1918 samples,	5	----------	68.49	3.33	4.88	7.43
1917 samples,	10	----------	63.07	2.59	7.72	6.00
1916 samples,	27	----------	73.14	3.46	4.34	4.79
Total average,	59	----------	70.01	2.97	6.19	6.62
Lime, high magnesia,	2	----------	51.88	35.40	2.43	14.50
1918 samples,	1	----------	54.00	37.83	2.94	----------
1916 samples,	1	----------	51.15	23.63	3.45	3.00
Total average,	4	----------	52.23	33.07	2.81	10.67
Hydrated lime, low magnesia,	26	----------	63.16	5.32	3.50	14.72
1919 samples,	55	----------	64.19	2.48	3.62	13.09
1918 samples,	57	----------	63.18	4.55	3.17	11.76
1917 samples,	50	----------	64.47	3.82	2.79	9.09
1916 samples,	54	----------	65.79	3.29	2.94	7.21
Total average,	242	----------	64.26	3.73	3.17	10.81
Hydrated lime, high magnesia,	16	----------	46.30	30.92	1.71	15.82
1919 samples,	30	----------	51.30	24.23	1.67	13.10
1918 samples,	24	----------	47.01	31.00	1.27	11.94
1917 samples,	19	----------	47.18	29.48	1.88	9.42
1916 samples,	18	----------	51.35	26.52	1.42	7.40
Total average,	107	----------	48.87	28.07	1.58	11.63
				SO_3		
Gypsum or land plaster,	2	6.79	33.05	39.52	7.11	18.00
1919 samples,	3	4.47	35.59	43.63	2.14	12.00
1918 samples,	3	8.77	32.86	41.99	2.28	17.33
1917 samples,	3	8.56	29.48	38.66	2.48	12.00
1916 samples,	4	6.89	33.24	43.19	9.71	12.00
Total average,	15	7.10	32.86	41.64	4.91	13.87

In the first Lime reports issued the averages included the high as well as the low magnesium types of Lime Products, however, in the preparation of the foregoing Table these types in the case of the Lime and Hydrated Lime classes were arranged separately and the average results shown in the earlier reports were revised to also include the low and high magnesia types. A study of these average results will show considerable uniformity in the several grades and wide variations in selling prices. The average content of calcium oxide in Pulverized Limestone, Artificial Carbonate and low magnesia Lime, show increases over the results reported for the previous year's samples and exceed the averages for five years' results. In the case of Burnt Lime, low in magnesia, the acid insoluble matter was twice as high as the average of this group with high magnesia contents. In the case of Hydrated Lime those brands low in magnesia averaged higher in total calcium and magnesium oxides and also contained about twice as much acid insoluble matter as those samples of the high magnesium type. It will also be noted that the retail selling prices for the 1920 brands averaged higher than the values prevailing for the four preceding years. In those grades of Lime Products where only a few samples are included the average results of any group or particular brand cannot be said to fairly represent the grades or brands included, however, the results of the analyses of the samples will be of interest in showing the approximate composition of the materials being offered for sale in the State. The total average percentages of calcium oxide and magnesium oxide, together with the average retail selling prices for each group of Lime Products analyzed during the past five years, are respectively as follows: Pulverized Limestone, 161 samples, 47.83 per cent., 3.19 per cent.; Pulverized Oyster Shell, 4 samples, 47.60 per cent., .85 per cent.; Atificial Carbonate of Lime, 72 samples, 50.70 per cent., 2.52 per cent.; Marl, 22 samples, 46.75 per cent., 1.00 per cent.; Lime (low magnesia), 59 samples, 70.01 per cent., 2.97 per cent.; Lime (high magnesia), 4 samples, 52.23 per cent., 33.07 per cent.; Hydrated Lime (low magnesia), 242 samples, 64.26 per cent., 3.73 per cent.; Hydrated Lime (high magnesia), 107 samples, 48.87 per cent., 28.07 per cent.; Gypsum, 15 samples, 32.86 per cent. calcium oxide, 41.64 per cent. sulphur trioxide.

LIME FACTORS.

In estimating the composition of the several classes of lime products, it is necessary to employ certain factors, which are derived from the chemical formulas representing them. As previously shown determinations are made for calcium oxide, magnesium oxide, carbon dioxide and sulphur trioxide. Carbonate of Lime is represented by the formula $CaCO_3$, Carbonate of Magnesia by $MgCO_3$, Gypsum or Calcium Sulphate by $CaSO^4$, Hydrated Lime by $Ca(OH)_2$, and Magnesium Hydrate by $Mg(OH)_2$. To estimate the amounts of these forms or combinations the percentages of Calcium Oxide and Magnesium Oxide secured are multiplied by their respective factors. In order that these factors may be at hand for reference, they are included herewith as follows:—

Given.	Required.	Factor.
Calcium oxide,	Calcium hydrate,	1.321
Calcium oxide,	Calcium carbonate,	1.7839
Calcium oxide,	Calcium sulphate,	2.4265
Calcium hydrate,	Calcium oxide,	.7570
Calcium carbonate,	Calcium oxide,	.5606
Calcium sulphate,	Calcium oxide,	.4121
Magnesium oxide,	Magnesium hydrate,	1.4468
Magnesium oxide,	Magnesium carbonate,	2.0913
Magnesium hydrate,	Magnesium oxide,	.6912
Magnesium carbonate,	Magnesium oxide,	.4782
Calcium oxide,	Sulphur trioxide,	1.4265
Carbon dioxide,	Calcium carbonate,	2.2757
Carbon dioxide,	Magnesium carbonate,	1.9159
Calcium carbonate,	Carbon dioxide,	.4394
Sulphur trioxide,	Calcium sulphate,	1.701

TABLE I.—PULVERIZED LIMESTONE AND OYSTER

Chemist's number.	Name of Manufacturer and Brand.	Sample Taken From—	Moisture.
	PULVERIZED LIMESTONE.		%
	CARBON LIMESTONE CO., YOUNGSTOWN, OHIO.		
C-805	Carbon Agricultural Ground Limestone,	S. N. Moore, Echo,	0.06
C-815	Carbon Agricultural Ground Limestone,	Wm. Radehouse, Greenville,	0.06
	F. E. CONLEY STONE CO., UTICA, N. Y.		
C-760	Raw Ground Lime (Ground Limestone),	G. R. Cark, Scranton,	0.07
C-790	Raw Ground Lime (Ground Limestone),	Farmers Cooperative Mercantile Co., Skinners Eddy.	0.10
C-782	Raw Ground Lime (Ground Limestone),	Summit Lumber Co., Clark Summit,	0.06
	THE FRANKLIN MANUFACTURING CO., FRANKLIN, PA.		
C-798	Franklin Brand,	H. A. Gibner, Stoneboro,	2.76
	GRANGERS' MANUFACTURING CO., WEST STOCKBRIDGE, MASS.		
C-830	Grangers' Agricultural Limestone,	Fred Mick, Creseo,	0.05
	THE KELLEY ISLAND LIME & TRANSPORT CO., CLEVELAND, OHIO.		
C-775	Bison Agricultural Ground Limestone (Buffalo).	E. L. Smith & Co., Union City,	0.10
	MICHIGAN LIMESTONE & CHEMICAL CO., BUFFALO, N. Y.		
C-819	Calcite Brand Michigan Limestone,	Bessemer Coal & Supply Co., Greenville.	0.07
C-826	Calcite Brand Michigan Limestone,	B. F. Edwards, Wellsboro,	0.08
C-831	Calcite Brand Michigan Limestone,	H. Kennedy, Cold Springs,	0.07
C-822	Calcite Brand Michiagn Limestone,	Floyd Merkel, Hamburg,	0.07
C-784	Calcite Brand Michigan Limestone,	Wm. Savitz, Hamlin,	0.07
C-817	Calcite Brand Michigan Limestone,	D. A. Thomas & Co., Saegertown,	0.08
	NEW CASTLE LIME AND STONE CO., NEW CASTLE, PA.		
C-816	New Castle Agricultural Limestone,	Seymore Hood, Cambridge Springs,	0.12
C-804	New Castle Agricultural Limestone,	Geo. Ifft & Sons, Evans City,	0.07
C-770	New Castle Agricultural Limestone,	Michael Scott, Franklin,	0.12
	SHENANGO LIMESTONE CO., NEW CASTLE, PA.		
C-796	Shenango Pulverized Raw Limestone,	Mahoning Supply Co., Mahoningtown.	0.20
C-821	Shenango Pulverized Raw Limestone,	Shenango Limestone Co., New Castle.	0.13
	THE SOLVAY PROCESS CO., SYRACUSE, N. Y.		
C-810	Solvay Pulverized Limestone,	E. A. Dunlap, Clark Summit,	0.13
C-783	Solvay Pulverized Limestone,	A. G. Hollister, Sehultzville,	0.08
C-789	Solvay Pulvezired Limestone,	E. H. Johnson, Ulster,	0.15
C-781	Solvay Pulverized Limestone,	A. E. Seamons, Factoryville,	0.11
	CHAS. WARNER CO., WILMINGTON, DEL.		
C-812	Pulverized Limestone,	E. A. Morgan, Pine Grove,	*0.05
		Average,	0.20

SHELL, ARTIFICIAL CARBONATE OF LIME AND MARL.

Calcium Oxide.		Calcium Carbonate.		Magnesium Oxide.		Magnesium Carbonate.		Insoluble matter.	Fineness.					Selling price per ton at place of selection.	Chemist's number.
									Coarsest Particles Pass Sieve Mesh No.—		Amount of Sample Passing Sieve Meshes.				
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		Found.	Guaranteed.	10 mesh.	50 mesh.	100 mesh.		
%	%	%	%	%	%	%	%	%	No.	No.	%	%	%	$	
51.10	53.65	91.16	95.70	0.72	0.22	1.51	0.47	7.56	10	10	100.0	85.4	74.0	7 00	C- 805
51.06	53.65	91.09	95.70	0.74	0.22	1.55	0.47	6.52	10	10	100.0	89.4	74.9	5 55	C- 815
50.10	53.00	89.37	94.55	1.50	1.30	3.14	2.72	7.44	10	10	100.0	44.8	34.6	10 00	C- 760
51.59	53.00	92.03	94.55	1.16	1.30	2.43	2.72	4.90	10	10	100.0	57.4	49.9	7 00	C- 796
50.25	53.00	89.64	94.55	1.46	1.30	3.05	2.72	6.00	10	10	100.0	46.1	35.3	8 25	C- 782
46.05	49.48	82.15	88.27	6.42	4.71	13.43	9.85	0.50	10	10	100.0	71.4	39.7	6 50	C- 798
39.09	------	69.73	------	7.53	------	15.75	------	15.35	40	------	100.0	99.4	88.4	7 75	C- 830
55.00	54.50	98.11	97.00	0.76	1.00	1.59	2.00	0.80	10	10	100.0	73.2	61.9	7 00	C- 775
55.20	------	98.47	------	0.72	------	1.51	------	0.45	10	------	100.0	69.6	55.7	9 50	C- 819
55.20	54.50	98.47	97.22	0.65	1.00	1.36	2.09	0.45	10	------	100.0	70.2	56.3	5 75	C- 836
54.99	54.50	98.10	97.22	0.72	1.00	1.51	2.09	1.20	10	------	100.0	70.4	58.4	6 50	C- 831
54.48	54.50	97.19	97.22	0.72	1.00	1.51	2.09	0.70	10	------	100.0	67.7	54.1	8 50	C- 822
54.37	54.50	96.99	97.22	0.67	1.00	1.40	2.09	1.24	10	------	100.0	68.7	55.5	10 00	C- 784
54.88	54.00	97.90	97.22	0.69	1.00	1.44	2.09	0.90	10	------	100.0	70.0	56.9	6 50	C- 817
49.19	46.75	88.75	85.00	0.75	0.70	1.57	1.40	9.25	30	10	100.0	95.1	83.7	7 00	C- 816
50.09	46.75	89.36	85.00	0.75	0.70	1.57	1.40	7.65	30	10	100.0	94.2	81.0	7 75	C- 804
50.10	46.75	89.37	85.00	0.65	0.70	1.36	1.40	7.90	20	10	100.0	89.3	73.3	5 75	C- 770
46.71	47.60	83.33	85.00	0.64	0.62	1.34	1.30	11.50	20	10	100.0	94.9	83.2	12 50	C- 796
46.81	47.60	83.50	85.00	0.89	0.62	1.86	1.30	12.65	30	10	100.0	97.1	87.8	6 22	C- 821
49.94	50.00	89.09	89.25	2.48	2.50	5.19	5.23	5.49	20	20	100.0	84.6	72.7	5 20	C- 810
49.46	50.00	88.23	89.25	2.25	2.50	4.71	5.23	5.71	20	20	100.0	88.1	75.4	5 25	C- 783
49.04	50.00	87.48	89.25	2.39	2.50	5.00	5.23	6.20	20	20	100.0	83.3	68.1	------	C- 789
48.60	50.00	86.70	89.25	2.43	2.50	5.08	5.23	6.39	20	20	100.0	83.6	68.7	5 25	C- 781
30.29*	29.00	54.03*	52.00	20.26*	19.00	42.37*	40.00	2.88*	30*	------	100.0*	98.6*	92.5*	7 00*	C- 812
50.58	------	90.27	------	1.64	------	3.43	------	5.51	15	------	100.0	78.0	65.6	$7 31	------

TABLE I.—PULVERIZED LIMESTONE AND OYSTER SHELL.

Chemist's number.	Name of Manufacturer and Brand.	Sample Taken From—	Moisture.
	PULVERIZED OYSTER SHELL.		
	THE POTOMAC POULTRY FOOD CO., INC., BALTIMORE, MD.		
C-793	Oyster Shell Dust,	J. E. Crisman, South Fork,	1.75
C-757	Oyster Shell Dust,	H. F. Hake, Wrightsville,	0.60
C-752	Oyster Shell Dust,	Harmony Cereal Mills, Harmony,	1.24
C-766	Oyster Shell Dust,	Steininger Brothers, Middleburg,	0.47
		Average,	1.02
	ARTIFICIAL CARBONATE OF LIME.		
	THE COLUMBIA PRODUCTS CO., CLEVELAND, OHIO.		
C-772	Plant Lime,	Oil City Woodworking Co., Oil City,	0.18
C-814	Plant Lime,	John Thompson, West Middlesex,	0.32
	NEW YORK & PENNSLVYANIA CO., JOHNSONBURG, PA.		
C-792	Nypen Agreultural Lime Preeipitated,	J. P. Jones Hardware Co., Summerville.	0.37
C-748	Nypen Agricultural Lime Precipitated,	P. J. Oesterling & Son, Butler,	0.31
		Average,	0.29
	MARL.		
	ALBA MARL LIME CO., CHARLESTOWN, W. VA.		
C-806	Alba Marl,	W. H. H. Beaver, Schellsburg,	0.40
	BONE DRY LIME CORPORATION, CASSADAGA, N. Y.		
C-773	Marloid,	Cochranton Milling Co., Cochranton.	3.58
	CONNEAUT LAKE MARL CO., HARMONSBURG, PA.		
C-750	Conneaut Marl Lime,	H. J. Klingler & Co., Butler,	2.72
C-797	Conneaut Marl Lime,	H. Ringer, Fredonia,	1.70
		Average,	2.10

ARTIFICIAL CARBONATE OF LIME AND MARL—Concluded.

Calcium Oxide.		Calcium Carbonate.		Magnesium Oxide.		Magnesium Carbonate.		Insoluble matter.	Fineness.					Selling price per ton at place of selection.	Chemist's number.
									Coarsest Particles Pass Sieve Mesh No.—		Amount of Sample Passing Sieve Meshes.				
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		Found.	Guaranteed.	10 mesh.	50 mesh.	100 mesh.		
%	%	%	%	%	%	%	%	%	No.	No.	%	%	%	$	
48.08	50.43	85.77	90.00	0.54	0.41	1.13	0.85	7.55	20	14	100.0	66.1	41.9	12 00	C-793
45.20	50.43	80.63	90.00	0.52	0.41	1.09	0.85	12.83	20	14	100.0	66.6	43.1	14 00	C-757
47.76	50.43	85.20	90.00	0.55	0.41	1.15	0.85	8.82	20	14	100.0	63.2	37.8	11 25	C-752
49.36	50.43	88.05	90.00	1.77	0.41	3.70	0.85	5.95	20	14	100.0	61.5	34.2	14 00	C-766
47.60	------	84,91	------	0.85	------	1.77	------	8.78	20	------	100.0	64.4	39.3	$12 81	------
50.32	45.00	89.77	80.00	4.50	5.00	9.41	11.00	0.57	20	10	100.0	86.0	75.8	10 95	C-772
47.95	45.00	85.53	80.00	7.37	5.00	15.41	11.00	0.92	10	------	100.0	88.6	78.4	12 00	C-814
53.41	53.50	95.28	95.50	0.80	0.75	1.67	1.57	0.70	20	20	100.0	94.9	90.6	12 00	C-792
53.94	53.50	96.22	95.50	0.75	0.75	1.57	1.57	0.55	20	20	100.0	85 1	80.1	13 00	C-748
51.41	------	91.70	------	3.36	------	7.02	------	0.68	15	------	100.0	88.7	81.2	$11 99	------
52.30	50.00	93.30	------	0.54	------	1.13	------	2.95	------	------	------	------	------	10 00	C-806
42.64	45.00	76.07	------	1.41	1.05	2.95	------	11.02	------	------	------	------	------	16 00	C-773
46.48	44.00	82.92	------	0.80	0.05	1.67	------	4.67	------	------	------	------	------	13 00	C-750
46.26	44.00	82.52	------	0.77	0.05	1.61	------	5.10	------	------	------	------	------	10 00	C-797
46.92	------	83.70	------	0.88	------	1.84	------	6.16	------	------	------	------	------	$12 25	------

*Excluded from average.

TABLE II.—LIME AND

Chemist's number.	Name of Manufacturer and Brand.	Samples Taken From—
	LIME.	
	(LOW MAGNESIA.)	
	HARRY BOCK, BEDFORD, PA.	
C-743	Burnt Ground Lime,	Harry Bock, Bedford,
	CLIMAX LIME & STONE CO., WICK, PA.	
C-768	Ground Lump Lime,	S. S. Smith, Mercer,
		Average,
	LIME.	
	(HIGH MAGNESIA.)	
	BLAIR LIMESTONE CO., MARTINSBURG, W. VA.	
C-813	Shenandoah Ground Lime,	Joseph Dreisbach, Weisport,
	MARION LIME & STONE CO., NORRISTOWN, PA.	
C-847	Run of Kiln Lime,	Merion Lime & Stone Co., Norristown,
		Average,
	HYDRATED LIME.	
	(LOW MAGNESIA.)	
	AMERICAN LIME & STONE CO., TYRONE, PA.	
C-759	Hydra-Oxide (H-O) of Lime for Agricultural Use.	McFarland Supply Co., Greensburg,
C-807	Hydra-Oxide (H-O) of Lime for Agricultural Use.	Cloyd E. Way, Cessna,
	BLAIR LIMESTONE CO., MARTINSBURG, W. VA.	
C-845	Opequon Hydrated Lime,	C. S. Hunter Co., Washington,
	CLIMAX LIME & STONE CO., WICK, PA.	
C-751	Hydrated Lime,	Harmony Cereal Mills, Harmony,
C-749	Hydrated Lime,	P. J. Oesterling & Son, Butler,
C-769	Hydrated Lime,	S. S. Smith, Mercer,
	THE INDUSTRIAL LIMESTONE CO., BETHLEHEM, PA.	
C-825	Bethlehem Brand Hydrated Lime,	Frank P. Miller, Riegelsville,
	KELLEY ISLAND LIME & TRANSPORT CO., CLEVELAND, OHIO.	
C-774	Tiger Agricultural Hydrated Lime (Marblehead).	Moss Brothers, Conneaut Lake,
	LEBANON FERTILIZER WORKS, LEBANON, PA.	
C-811	Levan's Lebanon Valley Hydrated Lime,	Harry Steily, Saeramento,
	PALMER LIME & CEMENT CO., NEW YORK, N. Y.	
C-764	Challenge Brand Hydrated Lime,	Houck & Cherrington, Catawissa,
C-741	Challenge Brand Hydrated Lime,	Oxford Grain & Hay Co., Oxford,
C-747	Challenge Brand Hydrated Lime,	S. Clayton Rauck, Leaman Place,
C-746	Challenge Brand Hydrated Lime,	Zinn Brothers, York,

HYDRATED LIME.

Calcium Oxide.		Magnesium Oxide.		Carbon dioxide.	Insoluble matter.	Selling price per ton at place of selection.	Chemist's number.
Found.	Guaranteed.	Found.	Guaranteed.				
%	%	%	%	%	%	$	
64.17	55.00	1.56	3.00	16.04	4.20	10 00	C- 743
77.18	70.00	0.85	0.80	2.94	7.20	19 03	C- 768
70.68	----------	1.21	----------	9.49	5.70	$10 02	----------
45.64	48.00	29.97	32.00	3.41	4.71	14 50	C- 813
58.11	50.00	40.82	30.00	1.21	0.16	----------	C- 847
51.88	----------	35.40	----------	2.31	2.43	$14 50	----------
68.12	65.00	3.19	2.00	----------	3.30	17 00	C- 759
63.80	65.00	2.50	2.00	----------	6.35	14 80	C- 807
59.93	65.00	2.28	2.00	----------	7.70	19 00	C- 845
62.47	60.00	0.65	0.80	----------	6.87	12 50	C- 751
63.53	60.00	0.69	0.80	----------	6.38	13 00	C- 749
63.53	60.00	0.69	0.80	----------	7.10	10 75	C- 769
65.41	65.00	2.86	3.00	----------	0.80	16 00	C- 825
61.40	54.00	14.03	16.00	----------	0.65	14 00	C- 774
60.14	65.00	12.98	3.00	----------	2.73	16 00	C- 811
69.63	70.00	1.74	3.00	----------	0.40	15 00	C- 764
64.39	70.00	9.11	3.00	----------	0.89	11 00	C- 741
67.37	70.00	6.16	3.00	----------	0.49	13 50	C- 747
66.52	70.00	8.58	3.00	----------	0.64	12 50	C- 746

TABLE II.—LIME AND

Chemist's number.	Name of Manufacturer and Brand.	Samples Taken From—
	THE PARAGON PLASTER & SUPPLY CO., BLOOMSBURG, PA.	
C-809	Paragon Hydrated Lime,	C. Pallman, Clark Summit,
C-833	Paragon Hydrated Lime,	The Paragon Plaster & Supply Co., Bloomsburg.
	READING CHEMICAL CO., READING, PA.	
C-835	Snowflake Hydrated Lime,	Farmers Co-operative Union, Ulysses,
C-840	Snowflake Hydrated Lime,	M. K. Hoke, Manheim,
C-763	Snowflake Hydrated Lime,	McConnell Brothers, Hughesville,
C-791	Snowflake Hydrated Lime,	Burton Williams, Mehoopany,
	ROBERT A. REICHARD, ALLENTOWN, PA.	
C-777	Reichard's Lehigh Hydrated Lime,	M. F. Williams, Jr., Neseopeck,
	ROSE POINT STONE & LIME CO., NEW CASTLE, PA.	
C-771	Peerless Hydrated Lime,	H. B. Mitchell & Co., Emlenton,
C-818	Peerless Hydrated Lime,	Wildrick & Wildrick, Hartstown,
	SECURITY CEMENT & LIME CO., HAGERSTOWN, MD.	
C-765	Berkely Hydrated Lime,	P. V. Heffner, Huntingdon,
C-834	Berkely Hydrated Lime,	N. B. Shober, Garrett,
C-799	Berkely Hydrated Lime,	E. H. Zercher, Mt. Joy,
	STEACY & WILTON CO., WRIGHTSVILLE, PA.	
C-801	Sterling Brand Hydrated Lime,	E. H. Keen & Son, Parkesburg,
	HYDRATED LIME.	Average,
	(HIGH MAGNESIA.)	
	G. & W. H. CORSON, PLYMOUTH MEETING, PA.	
C-826	Corson's Prepared Lime,	Edw. Brinton & Son, West Chester,
C-803	Corson's Prepared Lime,	Jerome Rutter, Strausstown,
	DIETRICK BROTHERS, READING, PA.	
C-779	Dietrick's Gold Medal Brand Hydrated Lime.	Abington Lumber Co., Dalton,
C-778	Dietrick's Gold Medal Brand Hydrated Lime.	Frances Heim, Auburn,
C-761	Dietrick's Gold Medal Brand Hydrated Lime.	John W. Meck, Jonestown,
	KNICKERBOCKER LIME CO., PHILADELPHIA, PA.	
C-802	Knickerbocker Hydrated Lime,	T. M. Griffith & Son, Downingtown,
C-824	Knickerbocker Hydrated Lime,	Frank R. Miller, Reigelsville,
C-839	Knickerbocker Hydrated Lime,	H. M. Stauffer, Leola,
	MERION LIME & STONE CO., NORRISTOWN, PA.	
C-846	Hydrated Lime,	Merion Lime & Stone Co., Norristown,
	F. W. TUNNELL & CO., INC., PHILADELPHIA, PA.	
C-786	Philadelphia Hydrated Lime,	Wm. F. Guth, Macungie,
C-740	Philadelphia Hydrated Lime,	W. B. Passmore, Embreeville,

HYDRATED LIME—Continued.

Calcium Oxide.		Magnesium Oxide.		Carbon dioxide.	Insoluble matter.	Selling price per ton at place of selection.	Chemist's number.
Found.	Guaranteed.	Found.	Guaranteed.				
%	%	%	%	%	%	$	
58.00	63.67	1.77	2.00	----------	3.15	12 25	C- 809
63.26	63.67	2.00	2.00	----------	3.75	----------	C- 883
57.89	65.00	14.94	3.00	----------	3.35	18 00	C- 835
58.75	65.00	8.47	3.00	----------	1.55	15 00	C- 840
60.34	65.00	13.27	3.00	----------	2.70	16 00	C- 763
58.95	65.00	13.59	3.00	----------	3.00	----------	C- 791
64.81	65.00	2.23	3.00	----------	4.18	----------	C- 777
49.53	55.00	0.92	1.50	----------	13.05	14 00	C- 771
58.42	55.00	1.05	1.50	----------	8.90	----------	C- 818
70.36	70.00	2.21	2.00	----------	0.40	16 00	C- 765
69.38	70.00	2.00	2.00	----------	0.25	17 00	C- 834
68.63	70.00	2.37	2.00	----------	0.48	12 50	C- 799
67.66	65.00	5.11	2.50	----------	2.17	16 00	C- 801
63.16	----------	5.32	----------	----------	3.50	$14 72	----------
44.25	42.00	29.98	27.00	----------	3.80	15 00	C- 826
44.14	42.00	29.16	27.00	----------	3.39	14 50	C- 803
46.37	46.00	30.20	30.00	----------	2.25	16 00	C- 779
48.72	46.00	29.98	30.00	----------	2.00	----------	C- 778
47.54	46.00	30.03	30.00	----------	1.75	----------	C- 761
47.36	45.00	33.50	30.00	----------	1.28	17 00	C- 802
45.97	45.00	30.71	30.00	----------	1.30	16 00	C- 824
48.33	45.00	32.77	30.00	----------	0.95	14 00	C- 839
45.76	45.00	32.15	30.00	----------	1.17	----------	C- 846
47.22	46.00	30.39	30.00	----------	1.20	14 00	C- 786
47.97	46.00	30.02	30.00	----------	1.59	13 50	C- 740

TABLE II.—LIME AND

Chemist's number.	Name of Manufacturer and Brand.	Samples Taken From—
	CHARLES WARNER CO., WILMINGTON, DEL.	
C-753	Warner's Limoid,	D. H. Bailey, Hamburg,
C-823	Warner's Limoid,	Emaus Coal & Lumber Co., Emaus,
C-827	Warner's Limoid,	S. Carl Gainer, Hatboro,
C-800	Warner's Limoid,	J. G. Hall, New Providence,
C-841	Warner's Limoid,	Jos. B. Weaver & Son, Gap,
		Average,

TABLE III.—GYPSUM OR

Chemist's number.	Name of Manufacturer and Brand.	Sample Taken From—
	THE AMERICAN AGRICULTURAL CHEMICAL CO., NEW YORK, N. Y.	
C-794	Ground Land Plaster,	H. L. Orr, Tyrone,
C-758	Ground Land Plaster,	Wm. H. Stock, New Oxford,
		Average,

HYDRATED LIME—Concluded.

Calcium Oxide.		Magnesium Oxide.		Carbon dioxide.	Insoluble matter.	Selling price per ton at place of selection.	Chemist's number.
Found.	Guaranteed.	Found.	Guaranteed.				
%	%	%	%	%	%	$	
45.31	42.00	31.76	28.00	----------	1.43	----------	C-753
43.17	42.00	30.60	28.00	----------	1.15	20 00	C-823
46.34	42.00	29.51	28.00	----------	1.40	18 00	C-827
46.69	42.00	32.52	28.00	----------	1.10	----------	C-800
45.66	42.00	31.43	28.00	----------	1.70	16 00	C-841
46.30	----------	30.92	----------	----------	1.71	$15 82	----------

LAND PLASTER.

Moisture.	Calcium Oxide.		Sulphur Trioxide.		Gypsum (Estimated $CaSO_4$.)		Insoluble matter.	Selling price per ton at place of selection.	Chemist's number.
	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
%	%	%	%	%	%	%	%	$	
0.31	28.78	30.48	36.36	45.00	61.85	74.00	13.15	18 00	C-794
13.28	37.31	30.48	42.68	45.00	72.60	74.00	1.07	----------	C-758
6.79	33.05	----------	39.52	----------	67.23	----------	7.11	$18 00	----------